

REMARKS/ARGUMENTS

In view of the following remarks, reconsideration and allowance of the claims is respectfully requested.

Status of the Claims

Claims 1-48 are pending.

Independent Claims 1, 26, 35, and 48 have been amended to recite that the pre-hydrolyzed pulp has a lignin content that is less than 1 wt.%. See, for example, paragraph [0028] of the instant application.

Prior Art Rejections

Claims 1 – 48 have been rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 6,512,110 to Heikkila et al. in combination with U.S. Patent No. 4,294,654 to Turner. Applicants respectfully traverse this rejection and request that the Examiner reconsider the rejections in view of the following remarks.

The primary reference, Heikkila, is directed to a process for the preparation of xylose from a paper-grade hardwood pulp which includes treating the pulp with a xylanase enzyme treatment. See Abstract. Heikkila repeatedly emphasizes that the process is directed to extraction of xylose from paper-grade pulp. See for example, Abstract; Column 1, lines 8 – 12; column 5, lines 14 – 16; Examples 1 – 21 and the Claims. In particular, Heikkila teaches the desirability of using an enzyme to recover xylose from a paper grade pulp. After xylanase treatment and removal of the xylan, the resulting pulp could then be used as a dissolving pulp. See column 5, lines 43 – 49. Thus, one of the end products of Heikkila's process is a dissolving grade pulp.

Turner is directed to a process of delignification (i.e., removal of lignin from unbleached pulp) and bleaching of lignocellulosic pulp using a photo-oxygenation reaction. See column 2, lines 45 - 52. Turner has absolutely no relation to a process for the production of xylose, and in fact, is completely silent with respect to the removal or recovery of xylose from the pulp. In particular, Turner teaches a process in which a stream of oxygen gas is introduced into a lignocellulosic pulp slurry. See column 3, lines 51 – 53. The pulp slurry is then irradiated with ultraviolet light that delignifies and bleaches the lignocellulosic pulp. See column 4, lines 1 –

27. In other words, Turner teaches a process for removing lignin from prehydrolyzed pulp using oxygen and ultraviolet light.

To establish a *prima facie* case of obviousness, three basic criteria must be met: 1) the prior art reference (or references when combined 1) must teach or suggest all the claim elements; 2) the combination of references must provide a predictable result; and 3) there must be a reasonable expectation of success. Further, the Office has to provide an explicit basis for combining the references.

In the present case, the pulp of Turner cannot be used in the process of Heikkila to arrive at the claimed invention. Specifically, the pre-hydrolyzed pulp described in Turner cannot be used in the process of Heikkila for the production of xylose as contemplated by the Examiner. In this regard, a Rule 1.132 Declaration of Dr. Jian Li is provided to show that the pulp of Turner cannot be used in the process of Heikkila to arrive at the claimed invention because the pulps described therein either have a lignin content that is greater than 1 weight % or a viscosity that is too low and cannot be used to produce xylose as in the claimed invention. As discussed in Paragraph 9 of his Declaration, Dr. Li states that the untreated pulps of Turner have relatively high lignin contents as evidenced by the Permanganate Nos. See, for example, Table XIII. According to Dr. Li's Declaration, it is well known in the pulping art that a Permanganate No. above 4.5 is indicative of a pulp having a high lignin content, and in particular, a lignin content above 1 weight %. As such, the untreated pre-hydrolyzed pulps of Turner cannot be combined with Heikkila to teach each and every element recited in the claims as amended, Namely, a pre-hydrolyzed pulp having a lignin content of less than 1 wt. %.

Dr. Li further states in Paragraph 9 that when such high lignin content pulps are extracted with cold caustic extraction, significant amounts of lignin will be removed from the pulp along with the xylan. The resulting hemicaustic will contain the same order of magnitude of lignin and xylan. The resulting hemicaustic cannot be used to make xylose because it is contaminated with so much lignin. Further, separation of the lignin from xylan in the hemicaustic is technically not possible. As such, one of ordinary skill in the art would recognize that the untreated pre-hydrolyzed pulps of Turner cannot be used in the process of Heikkila to arrive at the claimed invention because the resulting hemicaustic would have a high lignin content. Accordingly, for

this additional reason, the pulps of Turner cannot be used with the process of Heikkila to arrive at the claimed invention.

In paragraph 10, Dr. Li's statement provides evidence as to why one of ordinary skill in the art would also not use the treated pulps of Turner in Heikkila's process. In particular, the examples in Turner show that after treatment, the resulting pulps have relatively low viscosities. Specifically, the treated hardwood dissolving grade pulps (i.e., pre-hydrolyzed pulp) of Turner have low viscosities as evidenced in Table XIII. For instance, Runs 1-4 in Table XIII all have viscosities of less than 14.8 cps. Pulp viscosity is a measure of cellulose chain length. With such low viscosity, these pulps cannot be used by dissolving pulp customers to make different products. Basically, Turner's process produces an unusable dissolving pulp for end users of the pulp. For instance, Run No. 4 of Table XIII has a viscosity of 5.7 cps. This pulp is a useless pulp since its viscosity is too low to be used for almost all dissolving pulp products.

In addition to its useless nature for almost all dissolving pulp customers, more importantly, cold caustic extraction will extract significant amount of highly degraded cellulose along with xylan from this pulp. As such, the organics in the resulting hemicaustic of this bleached pulp will contain significant amounts of short chain cellulose, which will convert to glucose during acid hydrolysis. In contrast, the claimed invention is directed to the use of a pre-hydrolyzed pulp having a low lignin content as well as a high xylan content so that a high recovery of xylose is possible. Such a xylose recovery is simply not possible with the pre-hydrolyzed pulps of Turner. Thus, the pulps of Turner cannot be used in the process of Heikkila to arrive at the claimed invention.

Further, one of ordinary skill in the art would not be motivated to use the pre-hydrolyzed pulps of Turner in the process of Heikkila.

In *KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1739 (U.S. 2007), the Supreme Court held that in determining obviousness, one must look to whether the combination of the elements provides a predictable result. In the present case, one of ordinary skill in the art would not be motivated to use the prehydrolyzed pulp of Turner in the process of Heikkila for several reasons. In particular, Turner and Heikkila cannot be combined in a predictable way to arrive at

the claimed invention. In fact, the proposed combination is contrary to the teachings of the references.

First, Heikkila and Turner are directed to two very different and distinct purposes. As such, there can be no basis for asserting that the result of using a prehydrolyzed pulp, such as the one described in Turner, in the process of Heikkila would provide a predictable result, let alone provide the claimed invention. As noted above, Heikkila is directed to the production of xylose from a paper grade pulp using an enzymatic treatment. Turner on the other hand, is directed to a process for removing lignin from prehydrolyzed pulp using oxygen and ultraviolet light. As such, these patents and their respective teachings are completely unrelated to each other. In Paragraphs 7-8, Dr. Li provides several reasons why one of ordinary skill in the art would not be motivated to use the pre-hydrolyzed pulp of Turner in the process of Heikkila. As noted in Dr. Li's Declaration, the process and objective of Heikkila is quite different from the problem addressed by Turner, namely the removal of lignin from prehydrolyzed pulp using oxygen and ultraviolet light, whereas Heikkila is directed to using a xylanase treatment to recover xylose from a paper grade pulp. These two processes are completely different from each other and they include no teachings that would lead one of ordinary skill to combine them as contemplated by the Examiner. There is no basis for asserting that these disparate teachings can be combined to provide a predictable result. That is, one of ordinary skill in the art would not predict that the combination of Turner and Heikkila would produce the claimed invention. A person of ordinary skill in the art would not look to the teachings of Turner for a pulp to be used in the xylanase enzyme treatment process of Heikkila.

Additionally, Heikkila's process repeatedly emphasizes the benefits and advantages of using a paper grade pulp. In fact, Heikkila specifically teaches that it is the enzymatic treatments of paper grade pulp that results in the significant recovery of xylose. In contrast to Heikkila, Turner's pulp is a prehydrolyzed (i.e., dissolving grade pulp). Paper grade pulp and prehydrolyzed pulps are significantly different from each other and have different chemical structures, properties, and end uses. In view of these significant differences, there is no basis for asserting that it would be obvious to substitute the prehydrolyzed pulp of Turner for the paper grade pulp of Heikkila because the outcome would be uncertain at best. Accordingly, it cannot

be predicted that the use of a prehydrolyzed pulp, such as that described in Turner, in the process of Heikkila would arrive at the claimed invention. For this additional reason, the claimed invention is patentable over the cited references.

Further, it is clear that the Examiner is attempting to combine the references based solely on the fact that the Turner patent discusses a prehydrolyzed pulp. There are no teachings in either of the references that would lead one of ordinary skill in the art to substitute the paper grade pulp of Heikkila with the prehydrolyzed pulp of Turner, or that the result of such combination would result in a predictable outcome. In fact, Heikkila includes numerous statements that teach away from the use of dissolving-grade pulps, such as prehydrolyzed pulp, as a source of xylan/xylose. For example, Heikkila states at column 3, lines 3 – 7 that [t]he additional purification, which involves treatment with alkali to remove and destroy hemicelluloses and bleaching to remove and destroy lignin reduces the yield and increases the cost of "dissolving-grade" cellulose derived from wood pulp", and at column 3, lines 3 – 7, Heikkila describes that the processes used in preparing dissolving-grade pulps would result in decreased yields of pulp. Heikkila further states "[t]he low molecular weight of some of the hemicellulose fragments makes them hard to isolate, while in some cases (prehydrolysis kraft), the harsh conditions convert the hemicelluloses to decomposition products." See column 2, lines 41 – 44 (emphasis added). From these excerpts it can be clearly seen that Heikkila includes numerous statements that lead away from using a dissolving-grade pulp (i.e., a prehydrolyzed pulp) because the processes involved in the prehydrolysis process results in decomposition of the hemicellulose components, such as xylan. Based on these excerpts, it is clearly evident that the proposed modification would not provide a predictable result. Thus, one of ordinary skill in the art would not be motivated to use a prehydrolyzed pulp in the process of Heikkila, let alone in a process for producing a xylose.

One of the preferred objectives of Heikkila is the simultaneous recovery of xylose along with the production of a dissolving grade pulp. For example, Heikkila states "[i]n a preferred embodiment, the process of the present invention further comprises [the] simultaneous production of dissolving-grade pulp of very high quality and high yields of xylose." See column 5, lines 43 – 49. Thus, one of the objectives of Heikkila's process is the simultaneous production

of both xylose and a dissolving grade pulp. However, as established in Dr. Li's Declaration of October 31, 2007, a prehydrolyzed pulp is a dissolving grade pulp. As such, one of ordinary skill in the art would not select the use of a dissolving grade pulp (i.e., the prehydrolyzed pulp of Turner) as a starting product in the process of Heikkila. As discussed in paragraph 8 of Dr. Li's Declaration, one of ordinary skill in the art would not use the prehydrolyzed pulp of Turner in Heikkila's process because it would serve no purpose to modify the Heikkila process to include a desired end product as a starting product. Accordingly, one of skill in the art would not be motivated to modify the process of Heikkila to substitute a paper grade pulp with the prehydrolyzed pulp of Turner.

Moreover, using the prehydrolyzed pulp of Turner in the process of Heikkila would result in the pulp being unsatisfactory for its intended purpose. This is a clear indication that there exists a lack of predictability in arriving at the claimed invention based on the combination of Heikkila and Turner. In paragraph 11 of the accompanying Declaration, Dr. Li states that substituting Turner's prehydrolyzed pulp for a paper grade pulp in the process of Heikkila would result in significant loss of pulp viscosity, which would render the resulting pulp unusable. In particular, Dr. Li's Declaration establishes that if a prehydrolyzed kraft pulp, such as the one described in Turner, is treated in accordance with Heikkila's process, the resulting pulp would have an IV that would be too low to be used as a dissolving grade pulp. As such, the proposed modification would prevent one of the primary objectives of Heikkila and would make the resulting pulp unsatisfactory for its intended purpose. Accordingly, one of ordinary skill in the art would avoid using a prehydrolyzed pulp in the process of Heikkila.

Finally, the Examiner has provided no reasonable basis which would motivate one of ordinary skill in the art to make the proposed modification. The Examiner has attempted to gloss over this lack of motivation by stating that Turner teaches that the use of prehydrolyzed pulps are known in the art. However, the Supreme Court in *KSR* stated that in making an obviousness rejection, the Office must provide an explicit basis for making the combination. The Office has failed to do this. The fact that procedures involving a prehydrolyzed pulp may be known is not sufficient basis to provide motivation to use the pulp of Turner in the process of Heikkila. This

is particularly true given the numerous reasons set forth by Dr. Li why one of ordinary skill in the art would be motivated to not make such a modification.

In the final Office Action, the Examiner maintains that it would be obvious to substitute the wood pulp of Turner for the pulp of Heikkila because the prehydrolyzed hardwood pulp of Turner allegedly allows for greater ease of the raw material for the preparation of paper products. In maintaining the rejection, the Examiner fails to address the numerous technical reasons why one would not modify Heikkila as suggested by the Examiner. The Examiner also fails to address the July 25, 2008 Declaration of Dr. Li in which declaratory evidence was provided to establish why one of ordinary skill in the art would not be motivated to combine the references. In fact, the July 25, 2008 Declaration of Dr. Li was completely ignored by the Examiner. In reconsidering the rejections, it is respectfully submitted that each of the following points considered individually provide sufficient basis for withdrawal of the rejections.

1) Heikkila and Turner are directed to two very different and distinct purposes. As noted in paragraphs 7-8 of Dr. Li's Declaration, the process and objective of Heikkila is quite different from the problem addressed by Turner, namely the removal of lignin from prehydrolyzed pulp using oxygen and ultraviolet light, whereas Heikkila is directed to using a xylanase treatment to recover xylose from a paper grade pulp. These two processes are completely different from each other and they include no teachings that would lead one of ordinary skill to combine them as contemplated by the Examiner.

2) Heikkila repeatedly emphasizes the benefits and advantages of using a paper grade pulp for the recovery of xylose. Heikkila specifically teaches that it is the enzymatic treatments of paper grade pulp that results in the significant recovery of xylose. In contrast to Heikkila, Turner's pulp is a prehydrolyzed (i.e., dissolving grade pulp). Accordingly, one of skill in the art would not be motivated to substitute the paper grade pulp of Heikkila with the prehydrolyzed pulp of Turner.

3) Heikkila includes numerous statements that lead away from using a dissolving-grade pulp (i.e., a prehydrolyzed pulp) because the processes involved in the prehydrolysis process results in decomposition of the hemicellulose components, such as xylan. See column 2, lines 41 – 44 of Heikkila.

4) One of the preferred objectives of Heikkila is the simultaneous recovery of xylose along with the production of a dissolving grade pulp. See column 5, lines 43 – 49 of Heikkila. Thus, one of the objectives of Heikkila's process is the simultaneous production of both xylose and a dissolving grade pulp. Dr. Li's Declaration of October 31, 2007, provides evidence that a prehydrolyzed pulp is a dissolving grade pulp. As such, one of ordinary skill in the art would not select the use of a dissolving grade pulp (i.e., the prehydrolyzed pulp of Turner) as a starting product in the process of Heikkila. See paragraph 8 of Dr. Li's Declaration.

And

5) Using the prehydrolyzed pulp of Turner in the process of Heikkila would result in the pulp being unsatisfactory for its intended purpose. In his declaration, Dr. Li states that substituting Turner's prehydrolyzed pulp for a paper grade pulp in the process of Heikkila would result in significant loss of pulp viscosity, which would render the resulting pulp unusable. See paragraph 11 of Dr. Li's Declaration.

The above points clearly show that the rejection based on the combination of Heikkila and Turner is inappropriate, and therefore should be withdrawn. Applicant also submits that the Examiner has provided no reasonable basis which would motivate one of ordinary skill in the art to make the proposed modification. The Examiner has attempted to gloss over this lack of motivation by stating that Turner teaches that the use of prehydrolyzed pulps are known in the art. However, the Supreme Court in *KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (U.S. 2007), stated that in making an obviousness rejection, the Office must provide an explicit basis for making the combination. The Office has failed to do this. The fact that procedures involving a prehydrolyzed pulp may be known is not sufficient basis to provide motivation to use the pulp of Turner in the process of Heikkila. This is particularly true given the numerous reasons set forth by Dr. Li why one of ordinary skill in the art would be motivated to not make such a modification. Accordingly, the rejections should be withdrawn.

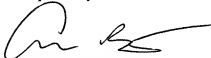
In view of the foregoing remarks, it is respectfully submitted that the Applicant has overcome the rejections under 35 U.S.C. § 103(a) and that the pending claims are in condition for allowance.

Appl. No.: 10/797,938
Amdt. dated 05/05/2009
Reply to Office Action of 11/05/2008

Conclusion

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



Timothy J. Balts
Registration No. 51,429

Customer No. 00826
ALSTON & BIRD LLP
Bank of America Plaza
101 South Tryon Street, Suite 4000
Charlotte, NC 28280-4000
Tel Charlotte Office (704) 444-1000
Fax Charlotte Office (704) 444-1111
LEGAL02/31298179v1

ELECTRONICALLY FILED USING THE EFS-WEB ELECTRONIC FILING SYSTEM OF THE UNITED STATES PATENT & TRADEMARK OFFICE ON May 5, 2009